

## INTRODUCTION

Our planet is a mess.

The past four years have been the four hottest on record, and July 2019 was the hottest month ever recorded. Greenland is expected to lose 440 billion tons of ice this year, a rate that was the “worst-case scenario” for 2070. The West is on fire, the middle of the country is flooded, and the Atlantic is seeing hurricanes of increasing frequency and intensity. In Alaska, salmon are dying because of the heat. All the while, the top 5 US oil and gas companies posted revenues over \$760 billion, and the federal government subsidized the industry to the tune of \$26 billion annually.

Climate change is an existential threat, and we need to recognize that we’re already living through the negative effects. The increase in natural disasters is costing us hundreds of billions of dollars, and the total cost of climate change will run into the trillions while taking an untold number of lives. And the people who are most affected by these impacts of climate change are the least able to deal with it - economically disadvantaged and minority communities face a disproportionate burden.

The right time to deal with this crisis was decades ago. We’ve waited too long, so we need to act fast and recognize that all options need to be on the table in order to adapt to the changed world we live in while mitigating behaviors that make it worse and reversing the damage we’ve already done. We can’t dismiss any ideas - especially not those that have support from the scientific community - or rule anything out because it doesn’t fit our ideological framework.

Why have we so far barely made a dent in what we need to do in order to combat this crisis? When 78% of our fellow Americans are living paycheck to paycheck, it’s hard to mobilize people to care about the massive problem of climate change. Many think, “I can’t pay my bills. The penguins will have to wait.” It’s impossible to think about the future if you can’t feed your kids today. We need to get the economic boot off of the throats of our fellow Americans so everyone can get their heads up and start facing this threat head-on.

We need to bring the full force of America to bear on this problem, or we will fail, and the world will suffer. My approach is five-pronged:

1. Build a sustainable economy by transitioning away from fossil fuels to renewable energy, upgrading our infrastructure, and improving the way we farm and use land. Public financing options will allow individuals to make the right decisions for their families.
2. Build a sustainable world. The United States, throughout history, has led the world in times of crisis. We’re the most entrepreneurial country in the history of the world. It’s time to activate the American imagination and work ethic to provide the innovation and technology that will power the rest of the world.

3. Move our people to higher ground. Natural disasters and other effects of climate change are already causing damage and death. We need to adapt our country to this new reality.
4. Reverse the damage we've done. Research needs to be done on removing carbon from our atmosphere, cooling the planet and rejuvenating ecosystems.
5. Hold future administrations accountable. We need to pass a constitutional amendment that creates a duty on the federal and state governments to be stewards for the environment.

Climate change is big, and it is scary. It's destabilizing the world, and it's costing American lives.

But it's also a massive opportunity.

We can make the United States the center of a new global, sustainable energy sector. This will bring money to the American people, and will create in installation and maintenance will be local and less likely to be automated. It will also reduce a primary source of income used by some of our biggest adversaries (Russia, Iran, Venezuela all rely on oil, and terrorist organizations utilize it as a primary fundraising mechanism). We can save the world for our children, make the environment healthier, and build a much stronger economy. We need to come together and get back to what America is all about - innovation, hard work, and solving the biggest problems the world is facing.

Let's go, America.

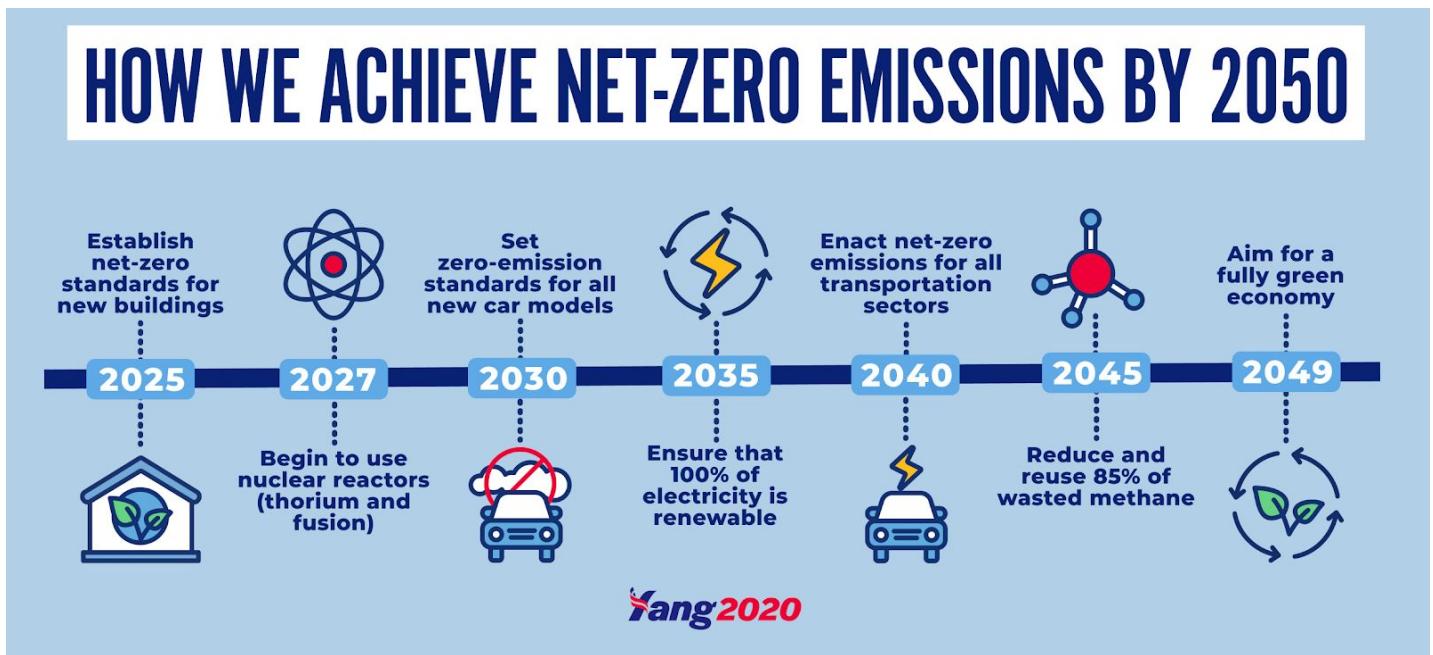
-Andrew

## Timeline

We need to set an aggressive but realistic timeline in order to hit the targets required to ensure that our way of life can continue, we don't lose trillions of dollars, and we don't lose thousands of American lives in the process.

### Achieve net-zero emissions goal - 2049

- 2025 - Establish net-zero standards for new buildings
- 2027 - New nuclear reactors (thorium and fusion) begin to come online
- 2030 - Zero-emission standard for all new cars
- 2035 - 100% renewable electric grid
- 2040 - Net-zero for all transportation sectors
- 2045 - 85% methane recapture
- 2049 - Fully green economy



## **Build to a Sustainable Economy**

Thanks in part to the activism of the millennial generation, combating climate change by moving to a sustainable economy is a central issue of the 2020 Presidential Election. Rep. Alexandria Ocasio-Cortez introduced the Green New Deal which accomplished exactly what it set out to achieve: sparking a national conversation about how we define the scope of the problem and the scope of the solution.

The backlash was immediate, and the argument against it was that it will cost us jobs, money, and growth. But I'm a numbers guy, and I looked at the math. This couldn't be further from the truth.

First, the impact of climate change in health outcomes and life expectancy, not to mention increased damage and lost lives from natural disasters, is in the trillions. And that's if it doesn't end up making the planet increasingly uninhabitable for human life.

Second, the last time we dedicated the American people to a massive manufacturing project - World War II - we grew our economy, kicked off decades of growth, and created a set of middle class jobs that provided upward mobility and a good life for half a century.

Why do so many people believe moving to a sustainable economy will have such a negative impact on our economy and individual budgets, then? Because of the oil companies. They've been making trillions of dollars for generations, externalizing all the costs to the world while burying reports on climate change and lobbying against climate legislation. When you're pulling in trillions of dollars, a few hundred million on lobbying and false advertisements is a drop in the bucket.

The wide field of democratic candidates presents an exciting opportunity for us to discuss how we will take on the fossil fuel industry and tackle this urgent global crisis. The Green New Deal has done a great job in starting the conversation, and its goals of lowering emissions, converting to renewable energy, and creating good paying jobs are commendable. We need to strive for these goals and set up a realistic plan utilizing all options in order to get to a fully sustainable economy ahead of 2050.

Oil companies will stop getting subsidized under my plan. The rest of us will see cheaper energy costs, better air quality, and new, local jobs that we can use to support our families.

## **Ending the Influence of Lobbyists and Oil Executives**

Americans want their kids to breathe clean air and drink clean water. They want to leave a healthy planet for their children.

Oil companies are spending hundreds of millions of dollars on lobbyists to stop that from happening. The oil and gas industry spent \$124.5 million on lobbying in 2018. This was a smart

investment on their part considering they receive \$26 billion annually in direct subsidies and far more in various indirect subsidies every year.

When your industry is looking at losing trillions of dollars, you'll spend nearly anything to prevent regulation, especially when those regulations will devastate your industry. It's time for us to end the power of lobbyists in the climate change debate. We need to ensure the workers in these industries are taken care of, but the executives can't continue to weaken the planet to line their own pockets.

As President, I will:

- *Ban anyone who serves in my administration from lobbying for a period of time after they leave their position.*
- *Ensure representation in my government for workers who will be displaced by our shift to renewable energy and a sustainable economy, so that we are sure to find solutions that enhance their quality of life.*
- *Refuse to hire anyone who formerly worked as a lobbyist for oil, gas, or coal company, or served in an executive capacity at one of those companies.*
- *Pass a Democracy Dollars bill, putting over \$20 billion directly in the hands of the American people annually to support politicians they agree with and wash out the influence of lobbyists.*

### **The American Scorecard - Economic Measurements of Sustainability**

Traditionally, the economy has been measured by looking at the gross domestic product (GDP) or the stock market. Companies are measured by their profitability.

However, these measurements are imperfect at best, and terrible at worst. The creator of the GDP stated, when he came up with it, that it doesn't reflect the full story, missing the value of raising children and ignoring actual wellbeing. And the Friedman Doctrine, stating that corporations have a moral responsibility to maximize profits, has resulted in these businesses externalizing many costs - especially environmental ones.

When you measure something, you implicitly set your policy goals. By focusing our measurement on GDP and share prices, we've promoted production and profitability over all else.

We need to move the way we measure the economy and corporate outcomes to actually take these environmental costs into account. If GDP goes up because oil companies make record profits, but levels of childhood respiratory illness also go up, we're not better off. If a company increases their share price by using cheaper but dirtier energy sources, they shouldn't be rewarded.

It's time to start including environmental measurements into account when we measure the economy, including (but not limited to):

- Environmental quality and sustainability
- Affordability of energy costs
- Childhood success rates
- Environment-related health outcomes
- Quality of infrastructure

Every year, during the State of the Union, I will report on these numbers, whether they improved, and what we're going to do to ensure improvement by the following year.

We also need to work with corporations in order to ensure that they're considering their sustainability in making their decisions. Any public corporation that has a valuation over \$1 billion should be required to file an environmental impact report for certain activities (such as money they spend on transportation, or opening a new building, or moving to a new manufacturing method), subject to verification by the EPA, that clearly states the financial cost of these activities on the environment, and any means they're taking to mitigate those effects.

Finally, we should also adopt the provisions of the Climate Risk Disclosure bills introduced in Congress to force companies to disclose what impact climate change will have on their operations to the SEC. Investors should be considering these long-term impacts when deciding where to invest their money, and I can guarantee that if the true cost of climate change was baked into corporate valuations, companies that are poised to be most impacted by climate change would see investment go down, thus pushing the economy towards more sustainable businesses.

*As President, I will:*

- *Create the American Scorecard to better measure our environmental quality and sustainability, and treat it as a primary measurement of our economy and wellbeing.*
- *Pass legislation requiring large corporations to document the externalized costs of their environmental impact.*
- *Pass Climate Risk Disclosure bills to incentivize divestment in oil companies and other heavy polluting industries.*

### **A Sustainable Economy - Energy**

Residential and commercial energy consumption accounts for somewhere around 50% of emissions. We can't move to a sustainable economy without getting our energy from renewable sources.

Tackling our energy supply is the biggest move we need to make in order to create a sustainable economy. We need a multi-pronged attack plan to decrease emissions in our energy sector, and we need to utilize all options available to us in order to ensure that we can hit the targets set out by the IPCC to limit climate change to manageable levels.

It is impossible to know right now which clean energy technologies are going to be the most efficient options in 10 or 20 years. The goal of having a renewable energy plan is to have a

starting point of where we will invest our time and research. First and foremost, it is important for our government to be able to adjust its plans as technology and more efficient solutions develop.

### **Direct Federal Action to Promote Renewables**

Over the past 100 years, the federal government has done much to prop up the oil and gas industry. Early on, that was the right move. Our industrializing nation needed cheap energy, and the long-term impacts of burning fossil fuels were unknown. Of course, that excuse went out the window 40 years ago when scientists first informed the oil companies that emissions were a major contributor to climate change.

Now that we *all* know the damage we're doing to the environment, we need to end our relationship with an industry that has lied to the American people while knowingly poisoning the Earth. It is clear now that executives for these companies knew of the damage they were doing, and put short-term profits over the health of Americans and the long-term prospects of the species. It's unbelievable to say that, but it's true.

In 2015, the federal government spent more on direct and indirect fossil fuel subsidies (\$649 billion) than it did on the Pentagon (\$599 billion). These subsidies are yet another factor that obscures the true cost of fossil fuels. That money would be better spent to help individuals transition to a sustainable economy - both the workers who work in these industries, and the rest of us who rely on fossil fuels to power our lives.

We also absolutely should not be providing leases to companies that are going to exploit public lands - both on and offshore - to harvest oil, gas, and coal. There is no way to get at these resources without permanently damaging our priceless public lands, and yet you can stake a claim to an acre for a buck fifty. We need to stop the practice of providing these leases, and move to end the current ones as quickly as possible.

Similar to ending these leases, we need to do everything we can to prevent further investment in infrastructure designed to support the oil/gas/coal industries. Most visible among these are pipelines. Once invested in, businesses have an interest in keeping them operational long enough to pay back their initial investment and turn a profit, which will keep them operational well past the point where they'd need to be closed down to keep climate change at a manageable level.

Under the EPA's mandate to regulate carbon, we need to increase our Clean Power Plan targets to make our electricity sector sustainable, and force all power plants to meet standards instead of just ones that are sufficiently upgraded to trigger a New Source Review.

Many communities - especially rural electric cooperatives - are currently using power from coal plants on which they owe billions of dollars. These communities want to shift their energy sources to renewables, but they can't afford to pay off their current debt - which is estimated to

be at least \$8.4 billion - on the old plants and build new ones, especially as the relative cost of coal increases (and will continue to as we end subsidies). The US government can forgive the debt for those co-ops that are looking to make a transition to renewable energy, and provide different financing options to these cooperatives to get them to move over to renewable sources.

The government also needs to dedicate itself to a massive investment in new technologies, and a promise to purchase American-made efficiency and renewable energy technologies. We must plan all infrastructure projects to include environmentally friendly materials and be powered by renewable energy, and we should incentivize corporations to do the same with their businesses. We should also commit to purchasing American-made items at a massive scale in order to incentivize businesses to manufacture these items. With the size of the federal government, a commitment to buying American efficiency and sustainability products will create massive demand that American entrepreneurs and businesses will be happy to fill.

Since these technologies are advanced but still developing, it'll be important for the government to also work with the companies innovating in these areas to create certain standards that will allow for interchangeability and upgrading. No one wants their electric vehicle to only be able to charge at certain stations because it uses a different standard - think about the last time you needed a USB-C but could only find a Thunderbolt cable. Battery technology will also likely develop rapidly, so we need to make sure that the hookups for them are standardized. Think about what the world would look like if roads weren't a standard size, and how the auto manufacturers never complain that they have to fit a standard, to see how welcome this change would be. We can also plan out our recycling program for batteries as they develop, and subsidize research into this process, so that we can ensure we don't litter the planet with old batteries as soon as the next generation is released. Sustainability means designing products with their disposal in mind.

Finally, we need to set sustainable infrastructure standards for all new buildings, and base any infrastructure spending on meeting these standards. All federal buildings should also be "upgraded" to meet these standards.

*As President, I will:*

- *End all fossil fuel subsidies and use that money for retraining programs and subsidies for low-income individuals to transition to sustainable energy sources.*
- *Stop all new leases for oil and gas companies on public lands, and end any currently existing lease.*
- *Fight against any new pipeline or similar infrastructure, especially any that would cut across contested land.*
- *Create more aggressive Clean Power Plan targets, and end the grandfathering-in of old plants that haven't been sufficiently upgraded to trigger NSR.*

- *Provide a \$10 billion debt forgiveness fund for all rural co-ops that are relying on non-renewable sources who want to replace their plants with renewables, and provide public financing/securitization options for rebuilding with sustainable energy.*
- *Commit to equipping and powering all federal buildings with American-made efficiency and clean energy technology.*
- *Work to create standards allowing common elements of systems (e.g., batteries) to be easily replaced as the technologies develop.*
- *Create a plan to recycle elements (e.g., batteries) that become obsolete.*
- *Set sustainable infrastructure standards for all new buildings; buildings that are being rebuilt or upgraded; and all federal buildings.*

### **Carbon Fee and Dividend**

The cost of burning fossil fuels is paid by all of us, but the benefits are disproportionately gained by industry. There is very little incentive to control the rate at which fossil fuels are burned or CO<sub>2</sub> is released into the atmosphere.

A carbon fee and dividend, similar to the one proposed by the conservative Climate Leadership Council, would allow businesses to find market-based solutions to their carbon emissions while benefiting American citizens and providing funding for alternative fuel research and upgrades to our current energy systems. By having it increase at regular intervals, we can allow businesses to plan for their transition to sustainable energy. By having those intervals be aggressive, we can be sure to hit our net-zero target on schedule.

Starting at \$40/ton, the fee would raise hundreds of billions of dollars a year. Increasing it by \$5/year for the first 4 years and then \$10/year until we hit net-zero emissions would ensure that businesses have a “deadline” for the transition, but can still make the transition on a timeline that makes sense for them. By some estimations, even a less aggressive carbon fee structure would reduce emissions by 90% by 2050.

While the amount of money would necessarily decrease over time, eventually zero-ing out, we can use the money before that time to help fund the transition to a sustainable economy, especially by subsidizing the costs of residential upgrades.

*As President, I will:*

- *Propose a carbon fee and dividend system that:*
  - *Sets an initial carbon tax of \$40/ton, which would increase in regular intervals of \$5/ton for the first 4 years and then \$10/ton until it hits \$100/ton.*
- *Create a border carbon adjustment to protect American goods that would:*
  - *Charge a fee on imports from countries that don't impose a similar carbon fee, or some type of carbon tax.*
  - *Provide a rebate on exports to countries that don't impose a similar carbon fee, or some type of carbon tax.*

- *Dedicate at least half of the money raised through the fee to dividends specifically designed to help Americans afford transitions to sustainable energy sources and vehicles.*

### **Grid Modernization Race to the Top**

Much of our electrical energy infrastructure is old, outdated, insecure, and far too dependent on dirty fossil fuels. Without renewed investment in new, cleaner assets and innovative management practices, our energy costs will become increasingly high and environmentally destructive.

In order to achieve 100% renewable electricity by 2035, we need to create an economic drive for utilities to invest in updating their infrastructure while motivating innovation. We can do this with a “Race to the Top” type competition where utilities compete to enact certain reforms and the winners receive federal monies to reduce the capital costs of their investment.

Investor-owned/municipal utilities and, separately, co-operatives would compete in two separate categories for a pool of \$25 billion dollars each. These utilities would be given two years to enact certain reforms or hit certain targets, with points being awarded for achieving the goals based on a schedule of points. Off-schedule points would be awarded by industry experts for innovation that achieves similar goals to the prescribed methods. A points floor would be set, and anyone above that floor would receive awards from the central pool proportional to their points.

Reforms and criteria would include, but not be limited to:

- Installation of smart meters
- Free, easy access for account holders to interval data
- Streamlined interconnection processes
- Short interconnection processing turnarounds
- Tariffs designed to encourage renewable systems of all sizes
- Implementation of active or passive control standards that enable real-time management of distributed assets not under direct utility ownership
- Methods of differentiating and optimizing the financial concerns of administration, transmission, production, and consumption, as separate grid-system functions
- Net de-carbonization from the installation and retirement of various assets
- Stakeholder education and outreach, including account holders, developers, and contractors
- Robust IT security for metering and control systems
- Demonstrating a continued interest, past the end date of the Race to the Top, in continuing to implement these changes

*As President, I will:*

- *Create a “Race to the Top”-style competition to drive innovation in our grid system by the private sector.*

- *Invest \$50 billion in incentives for private companies and investment in new modern infrastructure*
- *Invest \$150 billion in upgrading our current electric infrastructure systems.*

### Nuclear Power Stopgap

Nuclear power is a crucial component in the move towards creating sustainable, carbon-free energy for the United States. However, many people - including some other candidates - dismiss it out of hand.

Why does it have such a bad reputation?

Two reasons.

First, the public's perception of its safety has been skewed by TV shows like *Chernobyl* and *The Simpsons*. Second, nuclear waste is dangerous and long-lasting, and disposing of it is expensive.

Both points are less of an issue with modern reactors.

When the [OECD](#), [NEA](#), and [NASA](#) analyzed the actual danger of nuclear energy compared to other sources, they found that it caused orders of magnitude fewer deaths than fossil fuel-based energy. And that's not even considering the long-term impact of climate change from burning fossil fuels.

With modern reactors, safety is drastically increased, and nuclear waste is drastically decreased. After the completion of the Manhattan Project, America explored the option of using thorium as a potential source for civilian nuclear power. In the 1960s, the United States experimented with a thorium reactor to generate power, but the project was shelved in the 1970s. All the while, research into nuclear fusion devices continued in labs throughout the US.

Why did we go with uranium instead of thorium? Uranium is used in nuclear weapons; thorium isn't. Yet another benefit to using thorium as a power source!

Thorium reactors have a few key advantages over traditional uranium reactors:

- [One ton of thorium could potentially produce roughly 200 times more energy than one ton of uranium and 3.5 million times more energy than one ton of coal.](#)
- There is roughly 3 times more thorium on Earth than uranium, and we are already mining it as a byproduct of other rare-earth element mining. Right now, we're literally just burying it back in the ground.
- Thorium mining is substantially safer than uranium mining—thorium's primary ore, monazite, is retrievable from open pits which receives greater ventilation than the underground shafts from which uranium is mined, decreasing miners' exposure to radon.
- Thorium reactors produce less waste than uranium reactors. Thorium waste remains radioactive for several hundred years instead of several thousand years.
- Thorium-based molten salt reactors are safer than earlier-generation nuclear reactors, and the potential for a catastrophic event is negligible, due to the design of the reactor and the fact that thorium is not, by itself, fissile.

Nuclear isn't a perfect solution, but it's a solid solution for now, and a technology we should invest in as we move to a future powered primarily by renewable energy.

*As President, I will:*

- *Invest \$50 billion in research and development for thorium-based molten salt reactors, and nuclear fusion reactors, to provide a green energy source for Americans.*
- *Engage in a public relations campaign to update the reputation of nuclear reactors.*
- *Plan to start breaking ground on new, safe, thorium-based molten salt nuclear reactors by 2027*

### **A Sustainable Economy - Transportation (Ground)**

Transportation contributes to 29% of all US greenhouse gas emissions. We need to eliminate our transportation emissions by converting our modes of transportation to clean and renewable energy by 2040. The government needs to set aggressive standards, especially since vehicles stay on the road for decades after their manufacture. In order to hit our zero-emissions target, we need to require all models from 2030 on to be zero-emission vehicles.

This new fleet of primarily electric vehicles (EV) will require a massive installment of EV charging stations. Several states are already investing heavily in research of charging capabilities and installment of EV charging stations in big cities. For example, California has a goal of 1.5 million ZEVs by 2025 which includes investing \$800 million over 30 months to install EV charging stations. Utility companies are also investing \$1 billion in electric infrastructure.

We need to make sure that the areas in between the big cities are not left behind. My plan will invest \$50 billion in EV charging station infrastructure in order to ensure that there is complete coverage of charging stations across the country.

Additionally, we need to move public transportation to renewables. Public transit infrastructure all over the country is crumbling. The backlog cost to fix it is \$90 billion and estimated to reach \$122 billion by 2032. The government needs to start funding these projects now or else we risk losing more money. That's just common sense. Since we need to spend this money anyway, we might as well invest more up front to make our public transit systems run on renewable energy.

Every state operates a different public transit systems, so it is important that federal dollars earmarked for sustainable public transit be given directly to the states with specific standards and expectations of net-zero public transit by 2040 attached. The federal government can establish these standards, create a central database to share data between the states, and provide grants to states to ensure they make the transition to fully renewable public transit.

*As President, I will:*

- *Immediately create a system similar to the ZEV program in California, and require all vehicles starting with 2030 models to be zero-emission*

- *Invest \$50 billion in EV charging stations in nonurban areas.*
- *Create a \$200 billion grant program to states to convert their public transportation systems (trains, buses, school buses) to electric vehicles.*

### **A Sustainable Economy - Transportation (Air)**

No current technology exists that would produce a fleet of planes that could serve all Americans completely emission free. Fully electric aircrafts at that scale aren't likely to exist before 2050. Aircrafts also have a long life; many planes flown today will still be flying 20-30 years from now.

In order to move our air transportation emissions toward net-zero by 2040, we will need to (1) find alternative fuels that can significantly reduce current aircraft emissions, and (2) establish enough carbon capture systems to capture the aircraft emissions that remain. The government will invest in the carbon-capture piece of the puzzle, and we will require the private and commercial sector to figure out how to meet the lower emission standard with alternative fuel. The government should also provide incentives to commercial airlines that produce and utilize a certain number of emission-free aircrafts.

We are not in the business of telling the private sector how to run their companies. Instead, we want to spark innovation and creative solutions. Several alternative fuels could surface in the next 15-20 years that allow aircrafts fly with little to no emissions. Prospects include jet biofuel and sustainable aviation fuel made from algae, municipal waste, and used cooking oil. Recently, the largest emission-free plane just flew out over California; it ran solely on batteries and hydrogen.

As research continues and technology develops, the government will also have skin in the game. The federal government needs to invest \$20 billion (then less than half the amount awarded to defense aircraft contractors in 2019) annually for 15 years in developing low emission aircrafts for our military and government air travel. If the government manages to come up with a realistic fuel alternative before private research and development, the government will happily share it's findings.

*As President, I will:*

- *Pass the Aircraft Emission Act, requiring:*
  - *All commercial, private, and government aircrafts to move toward low-emission standards as is technically feasible by 2040.*
  - *Government investment of \$2 billion in carbon capture technologies research and \$9.5 billion over 15 years in installing carbon capture systems that can equal out the remaining limited amount of air travel emissions.*
  - *Government investment of \$300 billion over 15 years into research for alternative aircraft fuel.*

### **A Sustainable Economy - Agriculture, Forestry, and Land Use**

Agriculture makes up nearly \$1 trillion of the US economy. American farms feed the world, and our natural lands are a natural treasure. Both also are impacted by climate change, can be a driver of climate change, and need to be a part of the solution to the climate crisis we're facing.

Our current farming techniques were built up over a century where the primary concern was creating enough food to feed Americans and make a profit. Now, we also have to contend with climate change. Local climates are changing, natural disasters - especially floods, droughts, and wildfires - are becoming more frequent, and our soil is becoming depleted.

We need the government to work together with private enterprises to be better stewards for our land, to ensure that we can continue to feed our people with nutritious food.

The government needs to ensure that farms that experiment with new, more sustainable techniques have the money they need to test these techniques and still be protected in case it decreases yields. We also need to invest in alternatives to traditional farming, such as vertical farming techniques. And we need to research drought-resistant crops, along with other types of crops that can withstand the challenges of climate change. The federal government can also work with states to determine what crops are most sustainable in their areas, and track changes as climate change shifts the local climate.

The federal government has given nearly \$400 billion in farming subsidies since 1995. Subsidies help protect our food supply from "bad years" of extreme and unpredictable weather. Adjusting our agricultural system to adapt with climate change is a good example of why farming subsidies were created in the first place. A portion of planned farming subsidies over the next 15 years should be redirected specifically toward sustainable techniques and exploration of alternative farming methods.

We also need to make better use of our land, and the IPCC has laid out a great list of ways we can improve that. The Department of Agriculture should investigate the best grazing and livestock land management techniques, and provide reports to states and private enterprises on them. We need to identify land where we can plant more trees, and also take an active hand and expend the resources needed to rejuvenate our high-carbon ecosystems, such as peatlands, wetlands, rangelands, and mangroves.

We can also decrease the stress on our farmlands by decreasing food waste. Supermarkets can receive tax incentives to waste less food. This can be done through encouraging the donation of food. It can also be done by encouraging better inventory management - instead of overstocking, supermarkets can be encouraged to understock, with differences being made up through tax credits. They should also be sourcing more local foods, and incentives can be made to label all produce with where it's from.

Finally, we need to make better use of organic waste, both from livestock and from trash. Biogas - a type of biofuel that is generated by the decomposition of organic material - can

generate a large amount of electricity from what would otherwise be a giant source of methane and carbon dioxide. The EESI estimates that we can add over 10,000 new biogas systems, which would generate electricity, reduce emissions, and save municipalities a lot of money on both transporting waste and maintaining landfills.

*As President, I will:*

- *Provide grants and guarantee profitability for farms that experiment with new, sustainable techniques.*
- *Increase farm bill subsidies by \$75 billion over the next 15 years for farms that experiment with new, sustainable techniques.*
- *Invest \$2 billion in research for vertical farming techniques.*
- *Direct the Department of Agriculture to provide reports to states and private enterprises to help them improve their grazing and livestock land management.*
- *Work with states to determine sustainable crops for their areas, and suggest changes as climate change continues to advance.*
- *Increase funding to biogas programs by tripling the current annual mandatory funding for biogas to \$200 million.*
- *Authorize a \$500 million increase to federal agencies tasked with maintaining land to increase afforestation while rejuvenating high-carbon ecosystems such as peatlands, wetlands, rangelands, and mangroves.*
- *Invest in research for drought-resistant crops.*
- *Provide \$300 million in tax credits to incentivize supermarkets to waste less food, either through donations or inventory management changes, and to source more local food.*

### **A Sustainable Economy - Materials**

Humans make a lot of cement. A lot of it. Concrete is quite literally what the modern world is built on. Around 10 billion tons of concrete are made each year, and the process is very energy-intensive.

Concrete does naturally absorb carbon dioxide, but that's a slow process, and it doesn't fully balance out the amount released in its manufacture.

This is both a problem and an opportunity. As the world's population increases, and more of the world develops, we'll need more concrete. However, since we manufacture so much of it, if we can find a way to harness the material to combat climate change, the scale of it could make a dent in the problem.

Many different groups are currently investigating ways to improve the sustainability of concrete, or even make it carbon neutral. We should invest in research to see if we can increase the absorption rate of carbon dioxide, or even find ways to capture carbon and turn it into concrete or a concrete substitute.

The scale of concrete manufacturing makes it an ideal material to focus on, but we should also research other materials that can be used for a variety of functions that can help us combat climate change.

*As President, I will:*

- *Fund \$500 million in research over 5 years into ways to:*
  - *Decrease the carbon footprint of manufacturing concrete.*
  - *Make concrete carbon neutral or negative.*
  - *Utilize alternative materials - including alternatives to concrete - that can help us combat climate change.*

### **A Sustainable Economy - Data**

Planning for a sustainable economy isn't just about addressing current electricity needs. It's also about addressing the electricity needs of the future. One of the largest areas of growth in this regard is computing and data storage.

The world is using hundreds of terawatts of energy for data storage, and the US makes up a substantial portion of that. This energy consumption is also set to double every few years. We need to stay ahead of this problem as we generate and store more data.

The government needs to fund research into solutions for this problem, from increased efficiency, to better and smarter cooling solutions, to storing data in space (where temperatures and vacuum make storage more energy efficient, and solar energy is plentiful).

*As President, I will:*

- *Fund research into any method that could lower the energy requirements of data storage.*

### **A New National Labs**

There's been a lot of calls to research in the discussion of my plan to combat climate change. In order to funnel that funding and research efficiently, we need to set up a new system of National Labs that are much more distributed and less top-down than we've traditionally had in this country.

This new system - run through the Department of Technology - would hear proposals from different organizations on how they would use research funds in order to advance the fight against climate change. Different models would be considered and funded, without the organization itself proscribing any particular structure.

Funding through this organization would require sharing all data, and patents generated would face forced licensing so that others could build off of the successes.

America is a country of inventors, builders, entrepreneurs, and risk-takers. We need to unlock that energy to solve the greatest problem of our time.

*As President, I will:*

- *Create a new, distributed National Lab system, with a \$3 billion annual budget that allows for many different types of partnerships and organizations to work together to solve some of the biggest energy problems we face.*
  - *This system will lower the bureaucracy and hassle of working under a government contract so that scientists, engineers, inventors, and entrepreneurs can focus on innovating.*

### **Financing the New Economy**

Moving to renewable energy for personal use is important. It makes the home healthier. It lowers energy costs. It makes people feel like they're part of the solution.

It also requires a large up-front investment.

When the US wanted to ensure that everyone could own a home, we started Fannie Mae. When we wanted to make college more affordable, we created Pell grants.

In order to ensure that everyone can afford the investment to upgrade their houses to having solar panels, weatherproofing, heat pumps, and other technologies at their homes, we need to implement similar programs. With the right financing, people can afford the upfront costs, lower their energy costs, and end up coming out ahead. By setting interest rates low enough, we can get most households to upgrade their electricity to renewables while keeping more of their money. We can also provide grants to individuals at lower income levels so they can do the same.

*As President, I will:*

- *Create the Renewable Energy Building Association - REBA - to loan up to \$3 trillion over 20 years to individuals to purchase heat pumps, solar panels, batteries, and other technologies for their residences. If households choose to take advantage of this, they will pay off these loans at a 3% (or lower) interest rate and will end up paying less annually than their previous energy bills.*

### **Jobs**

The scale of the work that we're going to need to embark on is staggering and exciting.

As Saul Griffith, the founder of Otherlab, puts it:

*We need to manufacture electric heat pumps for 120 million American homes and 6 million commercial buildings. We need to manufacture 200+ million electric vehicles. We need 90 million solar rooftops, tens of millions of wind turbines, and billions of batteries,*

*not to mention new biofuel industries, new farming methods and technologies, and new approaches to forestry.*

And while many of these manufacturing jobs will be automated, the installation and maintenance of these systems will create good, middle-class, local jobs that will keep individuals employed for decades to come. We'll need to establish vocational and apprenticeship programs that will train American workers to install, maintain, and repair these systems, and then ensure that all Americans who so choose can receive this training, including through programs in high school.

*As President, I will:*

- *Ensure \$4 billion in annual funding for vocational and apprenticeship programs to meet the demand for installation and maintenance/repair technicians for the new, sustainable economy.*
- *Expand the high school curriculum to include programs to train individuals who want to enter one of these careers.*

## **Build a Sustainable World**

The United States is the most innovative and entrepreneurial country in the history of the world. We should be leading the world in the development of technologies to combat climate change. US turbines and solar panels should be powering the world.

Instead, we have a political party that's fighting against climate legislation tooth and nail, millions of Americans who deny that anthropogenic climate change exists, and a world that's leaving us behind.

This must change.

We need to recommit to the Paris Agreement. But that's only a beginning. It's time that we retake our role as a world leader. After all, we're only 15% of global emissions. While that's disproportionate to our population, it also means that, even if we get to zero emissions tomorrow, the world will continue to warm.

Let's rebuild our alliances and use our industry and innovation to provide clean energy to the world, thus making new allies and rebuilding the liberal, democratic world order that has kept us safe for the past seventy years.

## **Powering the World**

The US is innovative and extremely capable of developing cutting edge green technology. The private sector will be more motivated to invest time and energy in developing this green technology if companies can trust that they will be able to sell their products and technological advancements overseas.

When foreign governments want to buy goods from private US companies, the Export-Import Bank (EXIM Bank) finances the loan that allows foreign governments to purchase those goods. The EXIM Bank can make certain goods appear more attractive to other countries, by offering better financing options for different goals, like lower interest rates. Let's use its powers for good by making it cheap for other countries to buy US sustainable energy technology.

*As President, I will:*

- *Use the EXIM Bank, or create a new, Green EXIM Bank, to aggressively export US green technology throughout the rest of the world.*
- *Direct the State Department to engage in climate diplomacy, forming relationships with developing nations that are looking for partners in building an energy infrastructure that's sustainable.*

## **Trade Deals**

Once we cut fossil fuel subsidies and employ strict environmental regulations for manufacturing here in the US, corporations will want to move their operations overseas. After moving their

operations to countries that allow fossil fuel production, these corporations would then sell their products back to the US through various trade deals that protect the fossil fuel industry. This would render our efforts to stop fossil fuel production useless because corporations would literally be incentivized to take away American jobs while polluting the environment.

Additionally, the fossil fuel industries lobby to get trade deals to provide them with incentives for development, preferential treatment in trade, or carve outs to allow them to more aggressively combat the efforts of other countries to regulate their industry.

We need to ensure that our trade deals with other countries match our values and environmental goals. We need to renegotiate our trade deals that protect the fossil fuel industry. Instead, our trade deals need to ensure that any goods manufactured using unsustainable methods are appropriately costed, and the fossil fuel industries don't get unwarranted power in the deals.

*As President, I will:*

- *Ensure that any trade negotiation includes stringent environmental standards.*
- *Ensure that any trade deal doesn't include carve-outs or exclusives for oil, gas, or coal.*
- *Renegotiate any trade deal that includes carve-outs for fossil fuel industries, including the ISDS exceptions in NAFTA/USMCA.*

### **A Carrot and a Stick**

China has a strong geopolitical interest in investing in development projects in third world countries all over the globe. China also does not care about whether the projects it finances are environmentally sustainable. If we do not step in and compete with China in foreign development investments, then several countries will develop economies that operate and depend on practices that emit greenhouse gases.

It is the right thing for all of mankind that America invest heavily in these same development projects all over the world. Whether these investments are initiated by our government or by private corporations, the government needs to incentivize these projects to proceed in ways that are environmentally sustainable. Investments in non-environmentally sustainable projects should be more costly for everyone, and investments in environmentally sustainable projects should be greatly incentivized.

*As President, I will:*

- *Cut off or re-examine investments in projects that aren't environmentally sustainable.*
- *Increase foreign aid to developing nations to help cover the cost of any project that is environmentally friendly.*
- *Create tax incentives for individuals to invest in foreign corporations or projects that are environmentally sustainable.*

### **Positive Use of Military Expertise**

Both in our country and abroad, poor communities will suffer the most as climate change increases. Many people all over the world are already being displaced from their homes due to climate change and natural disasters, and the displacement is only going to get worse.

In 2017, 18.8 million people had to relocate within their country due to natural disasters and climate change. Experts predict that soon, these displacements will not be able to stay internal. A recent UN Report predicts several regions where conflict and violence will be exacerbated by large numbers of refugees that need to cross borders due to climate change.

Several Pacific Islands, including Fiji, Tuvalu, Kiribati, Vanuatu, and the Marshall Islands are predicted to go underwater within a few decades. Most of these islands already have plans for relocating their entire population should a cyclone or catastrophic disaster hit tomorrow that sends their entire island underwater. Small islands all over the world face the same threat. Most of these islands do not burn fossil fuels and have done nothing to contribute to climate change, yet they will soon be without a home country.

Climate change is a destabilizing force. The military considers it to be a threat multiplier. Over the past century, we've used our military to project our power abroad, and that's often led us to engaging in wars without a clear benefit to the US, or in regime change. Let's change that. Let's use our military to project our power abroad by stabilizing areas impacted by climate change, helping countries build or rebuild their infrastructure to be more sustainable, and ease the movements of climate refugees as areas become uninhabitable.

*As President, I will:*

- *Direct the Pentagon to proactively identify areas that are becoming destabilized by climate change and offer military assistance in stabilizing and rebuilding the region, improving its ability to withstand climate change.*

## **“Move to Higher Ground”**

The time to start fighting climate change was decades ago. Because we were irresponsible and didn't take the threat seriously, we're past the point where we can avoid some terrible impacts.

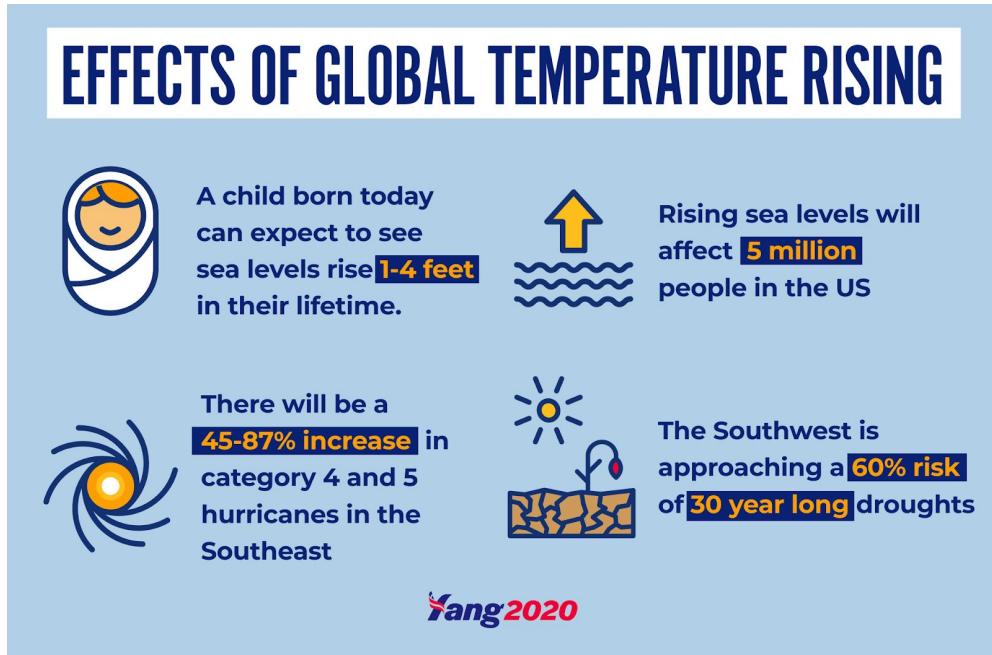
**We need to move to higher ground. Both literally and figuratively.**

As sea levels rise because of the melting of ice sheets in Greenland and the Arctic, hurricanes become more intense and frequent, floods become more common, and wildfires spread faster through a drier forest, we need to realize what is happening and adapt to our new world.

We need to come together to help those who are most affected by climate change in our country. As with most natural disasters, poor and minority communities are often hit the hardest.

Let's help our people out and ensure that everyone is as safe as possible from the world we've created.

## **EFFECTS OF GLOBAL TEMPERATURE RISING**



The infographic is titled "EFFECTS OF GLOBAL TEMPERATURE RISING" in large, bold, dark blue capital letters. It features four distinct sections, each with an icon and a text description. The first section on the left shows a baby wrapped in a blanket, with the text: "A child born today can expect to see sea levels rise **1-4 feet** in their lifetime." The second section on the right shows a yellow arrow pointing upwards over wavy lines, with the text: "Rising sea levels will affect **5 million** people in the US." The third section on the left shows a stylized hurricane eye with swirling lines, with the text: "There will be a **45-87% increase** in category 4 and 5 hurricanes in the Southeast." The fourth section on the right shows a sun over a dry, cracked landscape with a small plant, with the text: "The Southwest is approaching a **60% risk** of **30 year long** droughts." The bottom right corner of the infographic contains the text "Yang 2020" in a stylized font.

-  A child born today can expect to see sea levels rise **1-4 feet** in their lifetime.
-  Rising sea levels will affect **5 million** people in the US
-  There will be a **45-87% increase** in category 4 and 5 hurricanes in the Southeast
-  The Southwest is approaching a **60% risk** of **30 year long** droughts

**Yang 2020**

### **Move to Higher Ground - Sea Level Rise**

Estimates of sea level rise by 2100 range between 10 and 30 inches; a NASA's study landed towards the top of that range at 26 inches. Several other countries are already moving their populations to higher ground to escape the encroaching water, and America is likely to see communities needing to do the same. This will cost billions of dollars.

# RISING SEA LEVELS



Yang2020

As glaciers melt, the ocean expands with heat, and ice sheets in the Arctic and Greenland melt, we're heading for a crisis. Mother Jones put together an excellent article rounding up some of the numbers, including the 13 million people who might be displaced by the end of the century. 60% of communities on the East and Gulf Coasts may experience chronic flooding in the same time period.

We need to help individuals and communities prepare for this inevitability, either through direct adaptation of their residences, or by helping them to relocate.

*As President, I will:*

- *Research coastal communities that are likely to be impacted by rising sea levels and provide property owners with information about risks and options.*
- *Make up to \$40 billion available in subsidies, grants, and low-interest loans to individuals who wish to elevate or relocate their homes, or move to higher ground.*
- *Help communities plan for rising sea levels with expertise and information.*
- *Invest \$30 billion in high-risk cities to build seawalls and water pumps, upgrade roads and sewer systems, and rejuvenate beaches to serve as barriers to rising sea levels.*

## Move to Higher Ground - Floods, Hurricanes, and the NFIP

The severity of hurricanes has increased significantly in the past decade compared to trends of the previous century. Even if we manage to cut our global emissions enough to curtail severe climate change, studies predict that we are likely to see more than a 50% increase in category 4 and 5 hurricanes in the 21st century.

These hurricanes will continue to cause hundreds of billions of dollars in damage.

We must take steps toward permanent adaptation to this changing climate to minimize the repeated cycle of these hurricanes causing untold suffering and billions of dollars in damage, only to see these communities be rebuilt to be hit by another hurricane.

We must invest in innovative solutions for rebuilding our communities that reside in high risk flood and hurricane zones. We can turn to countries like the Netherlands, who invested \$500 million over 6 years (compare this to Hurricane Katrina in New Orleans which lost \$161 billion in a matter of days) to build a massive flood gate that permanently protects all of the Dutch homes that reside below sea level.

We can also look closer to home, at Hoboken, New Jersey. After Hurricane Sandy hit in 2012, the city initiated a major storm resiliency effort to rebuild its parks, sewer systems, pipes, and gardens to withstand massive floods. Hoboken lost over \$1 billion in Hurricane Sandy. As a result, it is spending \$140 million alongside \$230 million in federal aid to rebuild its city in a way that will prevent it from losing the same amount in future inevitable disasters.

Investments in flood prevention solutions that cost hundreds of millions can prevent us from annually losing tens of billions in catastrophic hurricanes. This funding will go towards redesigning cities at high risk of damage. By upgrading our coastlines to withstand incoming disasters from the sea, our entire country will be better protected.



Concurrently, we must reevaluate FEMA's policies, and our National Flood Insurance Plan.

FEMA's out-of date flood zone map needs to be updated to reflect the true 41 million homes that are at high risk for catastrophic flooding (not the 13 million it currently states). The Agency's prevention policy in response to floods and hurricanes is to rebuild homes and buildings that are "more resistant to flood damage." FEMA does not currently have a policy that prevents them from rebuilding homes located in high risk areas. As a result, several homes have received more federal aid to rebuild their homes than what the home is actually worth. For example, the same home in Baton Rouge, Louisiana, has been rebuilt 40 times, costing the government \$428,379 even though the home is only worth \$55,921.

Our National Flood Insurance Plan was designed to force the purchase of flood insurance for high-risk areas, thus increasing the cost of living there and causing people to move to safer areas. Unfortunately, people have continued for 50 years to live, build, and rebuild their homes in high risk flood zones. As a result, private insurance companies are in a position to make money when major natural disasters hit, leaving the NFIP over \$25 billion in debt.

Our federal agencies and plans that are designed to help those who are affected by hurricanes and floods must take a stricter line on rebuilding in areas that are likely to be damaged again. These organizations should absolutely help people after a natural disaster, but they should also

ensure that we're not throwing good money after bad, and relocate people as needed after disasters to ensure that they don't end up in the same position again.

*As President, I will:*

- *Invest \$25 billion over 10 years in helping communities that are likely to be impacted by repeated hurricane and flood damage to make their communities more disaster-resistant through pre-disaster mitigation grants.*
- *Reevaluate the way FEMA and the NFIP determine where structures can be rebuilt, taking a stricter stance against rebuilding in danger zones.*

### **Move to Higher Ground - Wildfires**

Decades of fighting the spread of all wildfires has prevented a natural cycle of thinning that had kept forest fires under control. Before European settlement of the West, 1.5m acres would burn each year; since then, it's been about 57k acres/year. Less than 2% of California forestland saw proactive treatment in some recent years, and one of the most effective means at controlling future fires – prescribed burns – is limited by cultural and legal hurdles, EPA standards and the Endangered Species Act. However, this takes a short-term view on the dangers of uncontrolled wildfires to both environmental quality and animals in these habitats.

We have a problem in this country, and it's costing us billions of dollars a year. It's only going to get worse as climate change exacerbates the problem. We need to start listening to what the experts recommend on how to control these fires.

More money needs to be spent on prevention to match the scope of the problem, and we need to properly fund the US Forest Service in order to proactively address threats before they become fires. We need to provide western states with the same amount of funding for local fire prevention and emergency preparedness planning initiatives. We also need to shift our cultural view that all wildfires must be stopped in order to allow the natural cycle to regain control.

These natural fires need to be supplemented with prescribed burns, which stay limited to their defined areas 99% of the time. The EPA must take a long-term view towards the dangers of megafires versus prescribed fires when analyzing the environmental impact of controlled burns.

Finally, we need the federal government to partner with state and local governments to aggressively collaborate in finding solutions to these life-threatening risks. The federal government can properly fund the cost of preventing and fighting fires on federal land, while also learning from state best practices in administering these prevention efforts. The federal government can assist state efforts by providing a federal fire insurance program that depends on the homeowner's compliance with state fire prevention policies. Incentives for developing land in safe areas also need to be implemented, either through changes to federal standards, changes to mortgage-interest deductions for housing built in high-risk areas, or the implementation of a federal fire insurance program, to price in the costs of living in high risk areas.

*As President, I will:*

- *Quintuple the budget for the U.S. Forest Service to \$24.5 billion for at least 5 years, and specifically tailor it to focus on fire prevention, and promote partnerships with local experts on combating wildfires in their areas. This will more than pay for itself by preventing megafires.*
- *Appoint a Secretary of Agriculture who recognizes the importance of preventing megafires using science-backed techniques.*
- *Work with federal agencies such as the EPA to adjust how specific metrics are measured to take a more long-term view of the costs and benefits of prescribed fires.*
- *Work with Congress to pass legislation aligning incentives for states, developers, and homeowners towards fire prevention and avoiding high-risk areas.*
- *Establish a National Fire Insurance Program that provides insurance for homeowners in high risk fire zones, with a stipulation that homes must take preventative actions such as defensible space and reevaluation standards in case locations are determined to be dangerous for rebuilding.*

### **Move to Higher Ground - Extreme Weather Effects**

Additional effects of climate change include extreme changes in precipitation, droughts, heavy downpours, heat waves, mudslides, tornadoes, avalanches, and more. Some will increase more than others, but we have to be prepared to deal with all of these natural disasters.

For example, the southwest can expect to see longer droughts and heat waves in the near future. In the past, droughts have not lasted for more than a decade, with the risk of a megadrought - droughts lasting over 30 years - below 12%. Scientists predict that risk of megadroughts in the Southwest is likely to increase to 60% in the coming years.

Urban areas will also see increased droughts, and they need to be prepared. They have higher water needs, but they also have the ability to utilize better urban planning to recapture a majority of the water they require.

The Southwest is expected to receive less precipitation over the next century, while northern states are expected to receive longer winters and springs. The exact effects of these extreme weather changes are tough to pinpoint, so we need to be proactive in our efforts to monitor the changes and come up with solutions.

These and other effects of climate change will continue to be unpredictable for years to come. To monitor the ongoing effects of climate change, I will establish the Climate Change Adaptation Institute. It will be tasked with monitoring the impact of climate change and recommending ways to adapt to the new world that we're living in. It's important to stay optimistic and mitigate our impact on the environment; it's just as important to adapt to the damage already done.

*As President, I will:*

- *Establish a Climate Change Adaptation Institute with a starting annual budget of \$4.5 billion to monitor the ongoing effects of climate change and propose new adaptation measures, including:*
  - *Better urban planning, better farming methods, and better land use, especially with respect to water management during droughts.*
  - *Educational drives to inform people on how to cope with heat waves, and prepare treatment centers to quickly respond to and treat individuals suffering from the effects of a heat wave.*
  - *Better equipping local officials to respond to emergencies such as floods, droughts, landslides, mudslides, avalanches and outbreaks.*

## **Reverse the Damage**

We've already done a lot of damage to the environment. Glaciers and ice sheets have melted, greenhouse gases have accumulated in the atmosphere, and more and more of our land is succumbing to drought, desertification, and wildfire.

To accept these as irreversible is to accept limitations to human ingenuity that I don't believe are true. Our scientists were able to unlock the power of the atom; they can also find ways to reverse the damage done to our world.

As I've said multiple times, we need to leave all options on the table to combat climate change. That includes geoengineering - methods to reverse the damage that we've already done to the environment. The urgency of our current situation highlights the need to keep investigating any and all solutions.

In general, geoengineering methods fall into two categories, though there are ideas that don't fit into either one. The first category is solar radiation management. These techniques decrease the amount of sunlight that hits the atmosphere, or reflects more of it back into space. The second category is carbon dioxide removal - techniques that remove the amount of carbon dioxide in the air. This latter category has already featured in earlier sections through ideas including afforestation, but there are more scalable examples we can research.

These techniques don't work as a replacement to moving to renewable energy. Outside of the impact on climate change, renewable energy has other benefits, particularly in cost savings and improvements to health. However, we should investigate geoengineering in case we can't change our behaviors fast enough to ward off the worst of climate change. We also don't fully understand our planet and climate, and we could hit a tipping point that would warrant more immediate and extreme action on a faster timeline.

If we don't start experimenting with these methods, then someone else will. Let's be a world leader in geoengineering so that we can ensure it's safe and scalable, and that we're in charge of deploying it, should the need arise.

### **First Options**

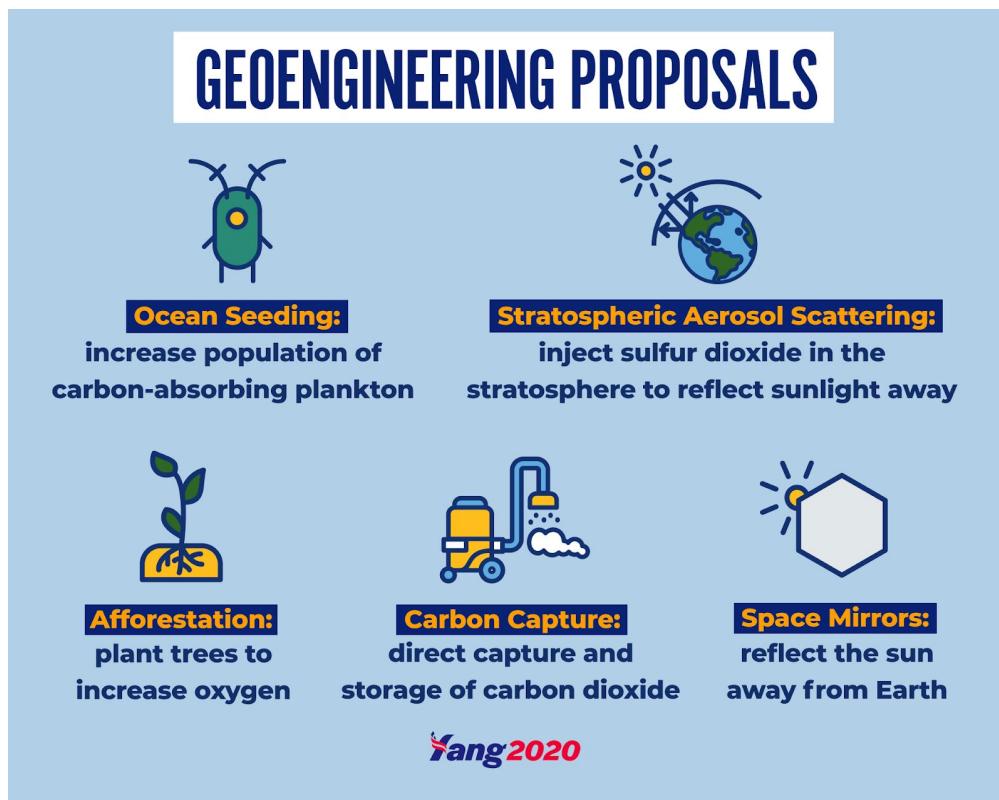
Certain geoengineering options are easy to reverse, or benign enough that we can feel safe deploying them without much further testing. For example, planting millions of new trees would store large amounts of carbon. Ethiopia recently planted 350 million new trees, and more countries can engage in similar projects. We should also engage in ocean afforestation, seeding the oceans with microalgae.

Additional carbon capture technologies can help us to remove a lot of the carbon from the air, a process that we know is safe because trees have been doing it for longer than humans have

existed. Not only that, but scientists largely agree that technologies in this area must be a part of any climate program.

Different organizations are researching the use of carbon capture to create building materials, carbon-neutral fuels (e.g., BECCS), and even ethanol. The federal government should encourage this research while still ensuring certain safety guidelines. We can also use this captured carbon to improve our soil (e.g., biochar). We can also take smaller steps, like packing gravel against the bases of glaciers to slow down their melting.

Finally, certain solar radiation management techniques are safe. For example, spraying salt water into clouds makes them larger and brighter, which will reflect more sunlight into space.



### Emergency Options

While the above solutions are important to investigate and can bend the curve to give us more time or serve as a partial solution to the climate crisis, we should also prepare for the worst. There are feedback loops that we don't understand that could quickly lead to a catastrophic event. If it comes to that, we need to be prepared with options that have potential side effects that are more desirable than the alternative: climate collapse.

Two primary ones to consider are space mirrors (yes, space mirrors) and stratospheric aerosol scattering.

Space mirrors would involve launching giant foldable mirrors into space that would deploy and reflect much of the sun's light. This method would be extremely expensive, which is why it should be investigated as a last resort. However, since we would be able to "undo" the mirror after deployment if needed, it's less permanent.

Stratosphere aerosol scattering, on the other, would be a drastic response to the climate crisis. When volcanoes erupt, they spew sulfur dioxide into the sky and reflect sunlight particles away from the earth. The massive eruption of Mt. Pinatubo in 1991 was recorded to help push global temperatures down half a degree over the following 2 years. If scientists can find a way to burn sulfur in the stratosphere, then they could mimic the positive effects of volcanoes eruptions on climate change and their ability to help keep the earth cool. Bill Gates has recently backed a study to explore the feasibility of this method, but there are many dangers to it, which is why it (and other, similar methods) require research.

*As President, I will:*

- *Provide \$800 million to NASA, the Department of Defense, and NOAA to research, experiment with, and test geoengineering methods that will either give us more time to deal with climate change, or give us options should we hit a climate tipping point of which we aren't aware.*
- *Convene a global summit on geoengineering. Many researchers in the US and other countries are doing work in this field - if we bring them together we can formalize and accelerate our learning and build a global approach.*

## **Holding Future Administrations Accountable**

Even if we make great headway in mitigating and adapting to climate change, there will still be voters and elected officials who choose to discount the basic scientific facts of our changing world. We need to prevent future administrations from untangling the significant advances we make in combating climate change.

I support the calls for a constitutional amendment requiring states and the federal government to protect, preserve, and improve the environment.

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By leaving all options on the table, heavily investing in research, and activating the patriotism, entrepreneurial spirit, leadership and community that American is known for, we can make sure that the planet is livable for our children and our children's children.

It's not going to be easy. It's not going to be quick. It's going to be a generational challenge, and there will be a constant need to find ways to make our impact on Earth more sustainable.

But, as many people have said, Earth is the only planet we've got.

Let's make it one we're proud to call home and pass on for generations to come.

-Andrew